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Grain Aeration Technique For Small Scale Formers

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Abstract

In this work, a control strategy for grain aeration system was proposed. Aeration is the process of forced movement of ambient temperature controlled air through a grain bulk, which will help to preserve or improve the physical conditions of the stored grain. This strategy was implemented using a microcontroller by relating a relative physical condition like temperature and humidity. The objectives of grain aeration are to maintain the temperatures inside the storage area, whenever the conditions inside the chamber deviate from the predefined value, to prevent the storage grain from contamination. This method was supposed to preserve grain over a long time without use of chemical agents or harmful substance. It has been receiving more attention among the local population as the small scale farmers where more benefited as it is cost efficient and also requires less maintenance compared to that of costly coolant chamber method. The results showed that the proposed strategy is efficient to achieve these objectives.

Keywords: *Ardiuno, temperature, Humidity, aeration.*

INTRODUCTION

Grain aeration is a popular grain storage tool offering harvest flexibility, expanded advertising possibilities and higher manipulate of grain pleasant, each at harvest and at some point of storage. Aeration is the method of moving air thru saved grain to lessen the price of grain deterioration and save you garage losses. because the variety of chemical manage options is decreased, grain aeration provides a effective non-chemical saved grain insect control option Aeration of saved grain has 4 essential functions are stopping mould, inhibiting insect improvement, maintaining seed viability and decreasing grain moisture. without aeration, grain can preserve its warm harvest temperature for a quick time. The purpose of aeration is to manipulate the temperature. Temperature differences in a bin of saved grain motive moisture emigrate from warmer regions to colder regions. Spoilage in stored grain is resulting from mildew increase and insect pastime, that's related to the moisture content material and temperature of the saved grain. The quantity of air required

depends on the desired rate of temperature change. Aeration greatly improves the "storability" of grain by maintaining a equal uniform temperature throughout the storage to reduce mold development and insect activity and to prevent moisture migration. It is implemented by operating a heater and blower in a controlled manner. Aeration technique is implemented in agricultural and commercial food processing industries. The Fig 1.1 indicates the block diagram for the entire mechanism

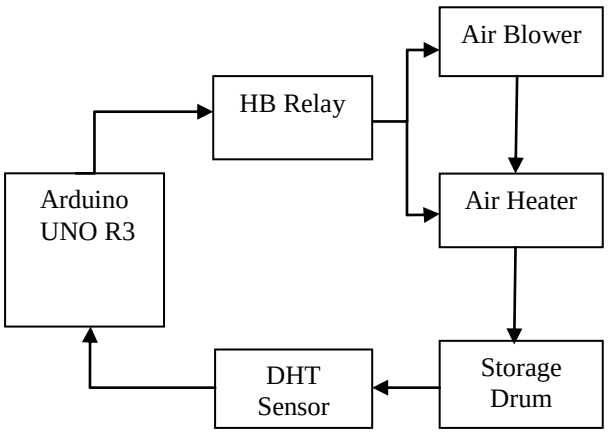

***Fig 1.1** Block Diagram*

METHODOLOGY

SENSOR SELECTION

Sensing the temperature and humidity condition of stored area by using a small in size, low power consumption and up-to-20 meter signal transmission sensor, called DHT sensor. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to user's request. The DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement issue and an NTC temperature dimension thing and connects to a high overall performance microcontroller. It offers awesome quality and rapid reaction.

***Table 1:** Item Description*

Item	DHT11
Measurement range	20-90%RH 0-50 ℃
Humidity Accuracy	±5％RH
Temperature accuracy	±2℃
resolution	1
package	4 pin single row

Relay with driver

Switches are used to indicate the temperature and humidity condition, this would be achieved by relay. It can operated on both electrically and mechanic -ally. Output from the microcontroller has lower current range in nA. It will be amplified by using relay with driver.

Darlington transistor (commonly called a Darlington pair by those in the electronics industry) is a compound structure of a particular design made by two bipolar transistors connected in such a way that the current amplified by the first transistor is amplified further by the second one. Output from the relay has higher current in mA. It will be input to the heater and blower.

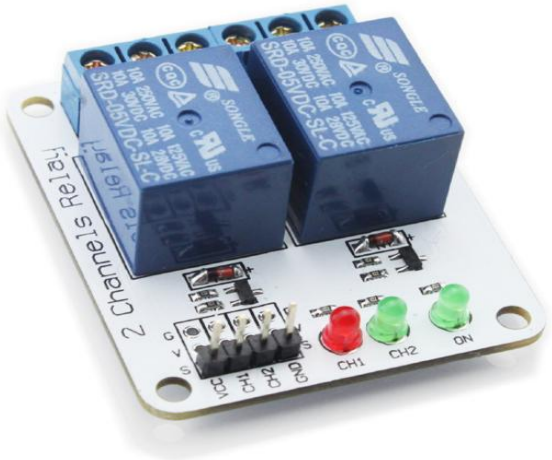

***Fig 2.1** Relay Driver*

An electric DC motor is used to circulate both warm and cool air inside the cab or the sleeper. The blower motor "blows" and circulate the warm air from the fine of the

heater core or cools the air as it passes from the fins of the evaporator.

Arduino UNO

Arduino is open-source hardware and a microcontroller board based totally at the ATmega328P (datasheet). It has 14 virtual enter/output pins (of which 6 may be used as PWM outputs), 6 analog inputs, a sixteen MHz quartz crystal, a USB connection, a electricity jack, an ICSP header and a reset button. The Arduino boards are geared up with units of virtual and analog enter/output pins that may be interfaced to various growth boards (shields) and other circuits. The forums characteristic serial communications interfaces, inclusive of popular Serial Bus (USB) on some fashions, which are also used for loading programs from non-public computers. Microcontroller kits for build virtual gadgets and interactive items which could sense and control objects in the physical international.

The micro-controllers are normally programmed the usage of a dialect of capabilities from the programming languages C and C++

It contains everything needed to support the microcontroller; simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Fig.3.1 *Arduino UNO*

Heater

Low temperature heater allows 24 hour grain drying when cool damp condition prevails. The heater is easily installed between blower and the bin. It allows the lower humidity up to 50% and removal of moisture from grain in high humidity conditions. Minimal operating Costs with reduced drying-time.

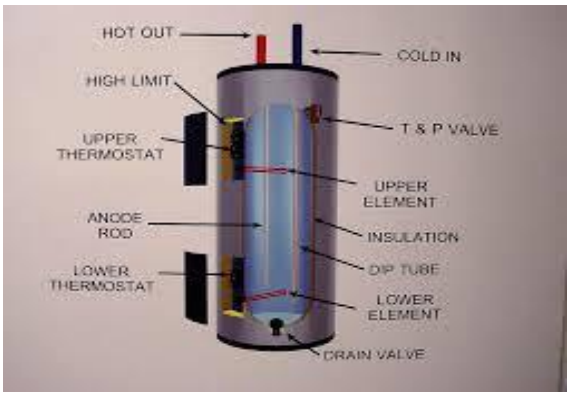

Fig.3.2*.Heater*

PROJECT DESCRIPTION

Due to the deficiency of proper grain storage mechanisms in India there are lot of grains wasted every year. The humidity and temperature plays a major role in reduction the quality of food grains. If there is a method to control both the parameters in the storage chamber, it would result in the safe housing of food grains. There are several methods to maintain the temperature and humidity condition in the chamber, but they require human intervention. In this project, a semi-autonomous machine was developed to control the temperature and humidity inside the chamber. The machine has a heater, a blower and controlling electronics. The main sensing element used is DHT sensor which senses both temperature and humidity, corresponding to the output signal from the controller. The microcontroller used here is ARDUINO UNO R3. The microcontroller has an IDE that is programmed to switch ON and OFF the blower and the heater through relay. HB relay is used to boost up the Arduino voltage into some appreciable

voltage that can drive the heater and the blower. Based on the DHT sensor, output to the controller will turn OFF the Heater and also the blower. This results in maintaining the temperature and humidity in the storage drum. The delay in shutting down period of the blower is to cool down the heater which may result in vaporization of the heater material.

This closed loop process does not require any external man-power after installation. This also has the advantage over manual control as that carelessness in the operation of heater by humans may be resulting in excess heating of the grains, this can be prevented by this automated grain aeration technique.

RESULTS

The results of this experiment indicated that efficient aeration can be achieved using the control strategy. Based on the results obtained in this work, the controller showed a significant potential for heating and maintaining the grain bulk under levels that reduce insect and mold activities. Inspite of this control strategy requires reliable equipment and software, it is powerful enough to meet the needs of optimum grain storage, electrical energy saving, data simulations and data saving. As the controller evaluates the relationships between simulated and real data, it can be used in different regions, during different seasons and with different aeration systems, automatically adjusting its set points. In future, grain aeration will be implemented with solar panel for low power consumption. It will be useful for small scale farmers and Ration shops. Table 2 shows different voltage outputs from sensor at different temperature levels and their corresponding Arduino baud rate.

TABLE 2

Temperature (^{0}C)	**Voltage output from DHT sensor (Volt)**	**Corresponding Arduino Output (Baud Rate)**
20	1.818	372
25	1.968	403.04
30	2.118	433.76
35	2.268	458.34
40	2.418	482.92
45	2.568	507.50
50	2.718	532.08
55	2.868	556.66
60	3.018	581.24
65	3.168	605.82

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